

Article 34

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## CLAIMS

1. (Amended) A reflective liquid crystal device comprising in sequence a linear polariser, a retarder arrangement comprising two retarders, and a reflector, characterized in that,

in at least one state of the device, a first of said retarders acts to rotate linearly polarised light of wavelength  $\lambda$  and a second of the retarders acts to convert linearly polarised light of wavelength  $y\lambda$  (where  $0.7 < y < 1.3$ ) to substantially circular polarised light, and

at least one of the said first and second retarders comprises a Bistable Twisted Nematic (BTN) liquid crystal.

2. (Cancelled)

3. A device according to claim 1, wherein the BTN is switchable between a first state in which it rotates linearly polarised light and a second state in which it does not rotate linearly polarised light.

4. A device according to claim 1, wherein the BTN is switchable between a first state in which it substantially converts linearly polarised light to circularly polarised light and a second state in which it does not convert linearly polarised light to circularly polarised light.

5. A device according to any one of claims 1 to 4, wherein the retarder adjacent to the polariser is a fixed retarder with an optic axis at an angle  $\theta_1$  to either the transmission or absorption axis of the polariser, and the retarder adjacent to the reflector is a BTN which in the low twist state,  $\phi$ , has the input director (LC director at cell surface adjacent to retarder) at an angle  $\theta_2 = 2\theta_1 + \theta(\phi) + x$ , wherein  $x < 5^\circ$ .

6. (Cancelled)

Sub 22  
7. A device according to claim 5 or 6, wherein  $\theta_1$  is substantially  $15^\circ$  and the low twist state is substantially  $\phi = 0^\circ$ .

8. A device according to claims 5 or 6, wherein  $5^\circ < \theta_1 < 25^\circ$  and the low twist state is substantially  $\phi = 63.6^\circ$ .

9. A device according to claim 5 or 6, wherein  $\theta_1 = 15^\circ$  and the low twist state is substantially  $\phi = 63.6^\circ$ .

Sub 25  
Sub 23  
Sub 27  
10. A device according to claim 8, wherein  $\theta_1 = 6^\circ$  and the low twist state is substantially  $\phi = 63.6^\circ$ .

11. A device according to claims 4 or 5, wherein  $5^\circ < 90^\circ - \theta_1 < 25^\circ$  and the low twist state is substantially  $\phi = 63.6^\circ$ .

12. A device according to claim 11, wherein  $\theta_1 = 84^\circ$  and the low twist state is substantially  $\phi = 63.6^\circ$ .

13. A device according to claim 5, wherein  $\theta_1$  and  $\theta_2$  are both substantially  $15^\circ$  and the low twist state is substantially  $\phi = 85^\circ$ .

Sub 24  
14. A device according to claim 1 or 2, wherein the retarder adjacent to the polariser is a BTN which in the low twist state has  $\phi = 0^\circ$  and optic axis at an angle  $\alpha$  to either the transmission or absorption axis of the polariser and the retarder adjacent the reflector is a fixed retarder with optic axis at an angle  $2\alpha + 45^\circ + x$ , wherein  $x < 5^\circ$ , preferably  $0^\circ$ .

15. (Cancelled)

Sub 29  
16. (Amended) A reflective liquid crystal device comprising in sequence a linear polariser, a retarder arrangement comprising two retarders, and a reflector, characterized in that,

a first of said retarders provides a retardation of substantially  $m\lambda/2$  and a second of the retarders provides a retardation of substantially  $n\lambda/4$  where  $m$  is an integer and  $n$  is an odd integer,

at least one of the said first and second retarders comprises a Bistable Twisted Nematic (BTN) liquid crystal, and

the at least one of the said first and second retarders is switchable between a first state in which the retarder provides a retardation of substantially  $m\lambda/2$  or  $n\lambda/4$  and a second state in which the retardation is substantially zero.

17. A device according to claim 16, wherein the wavelength  $\lambda$  is an operating wavelength of the reflective liquid crystal device and is in the range 400-700nm.

18. A device according to claim 17, wherein the wavelength  $\lambda$  is in the range 420-600nm.

19. A device according to claim 18, wherein the wavelength  $\lambda$  is in the range 440-550nm.

20. A device according to any of claims 16 to 19, wherein the retarder comprising a BTN liquid crystal provides a retardation of  $n\lambda/4$ .

21. (Amended) A reflective liquid crystal device comprising in sequence a linear polariser, a retarder arrangement comprising at least three retarders, and a reflector, characterized in that,

at least one of said retarders comprises a Bistable Twisted Nematic (BTN) liquid crystal, and

the at least one of said retarders is switchable between first and second retardation states.

22. A device according to claim 21, wherein the retarder adjacent to the reflector acts to convert linearly polarised light of wavelength  $y\lambda$  ( $0.7 < y < 1.3$ ) to substantially circular polarised light, and the two other retarders act to rotate linearly polarised light of wavelength  $\lambda$ .

23. A device according to claim 22, wherein the retarder adjacent the polariser is at angle  $\alpha$  to the axis of the polariser, the next retarder is at angle  $\beta$  to the axis of the polariser and the retarder adjacent the reflector is a BTN which in the low twist state,  $\phi$ , has the input director (LC director at cell surface adjacent to retarder) at an angle  $2(\beta - \alpha) + \theta(\phi) + x$  to the axis of the polariser wherein  $x < 5^\circ$ , preferably  $0^\circ$ .

24. (Cancelled)

25. A device according to claim 24 in which  $\alpha = 6.9^\circ$  and  $\beta = 34.5^\circ$ .

26. A device according to claim 21, wherein the retarder adjacent to the polariser acts to rotate linearly polarised light of wavelength  $\lambda$ , the middle retarder acts to convert linearly polarised light of wavelength  $y\lambda$  ( $0.7 < y < 1.3$ ) to substantially circular polarised light, and the retarder adjacent to the reflector is a BTN device.

27. A device according to claim 26, wherein the retarder adjacent to the polariser has optic axis at  $\alpha$  to the axis of the polariser, the middle retarder has optic axis at  $2\alpha + 45^\circ$  to the axis of the polariser.

28. A device according to claim 27, wherein  $\alpha = 15^\circ$  and the BTN has a low twist state of  $0^\circ$  orientated at  $75^\circ$  to the transmission axis of the polariser.

29. A device according to claims 21, wherein said at least one retarder provides a retardation in said first state of substantially  $m\lambda/2$  or  $n\lambda/4$  where  $m$  is an integer and  $n$  is an odd integer, and a retardation in said second state of substantially zero.

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*B5 Cont.*  
30. A device according to claims 22 to 29, wherein the wavelength  $\lambda$  is an operating wavelength of the reflective liquid crystal device and is in the range 400-700nm.

*Sub 29*  
31. A device according to claim 30, wherein the wavelength  $\lambda$  is in the range 440-550nm.

*Sub 36*  
32. A device according to any of the preceding claims in which the BTN switches between a state  $\phi$  and  $(\phi \pm 360^\circ)$ .

*Add 010*  
33. A device according to any of the preceding claims in which the BTN switches between a state  $\phi$  and  $(\phi \pm 180^\circ)$ .